WELL. HERE WE ARE.
WHERE IS IT?
UP THERE.
AND WE ARE GETTING UP THERE....HOW?
STAIRS....LOTS... AND LOTS...OF STAIRS.
PANT... PANT...WELL...IF I DON'T PASS MY BIOLOGY TEST... MAYBE I CAN TRY OUT FOR THE TRACK TEAM...PANT...AFTER THIS....
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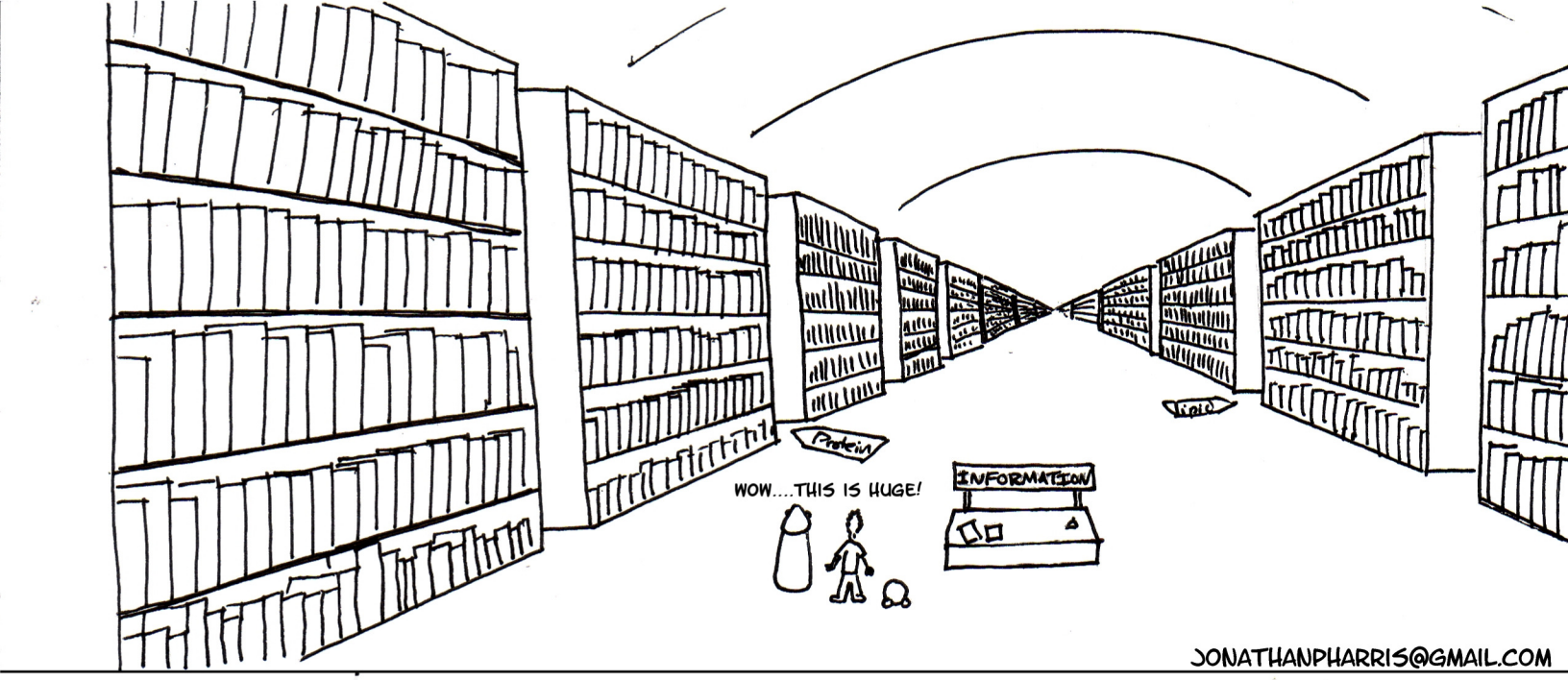
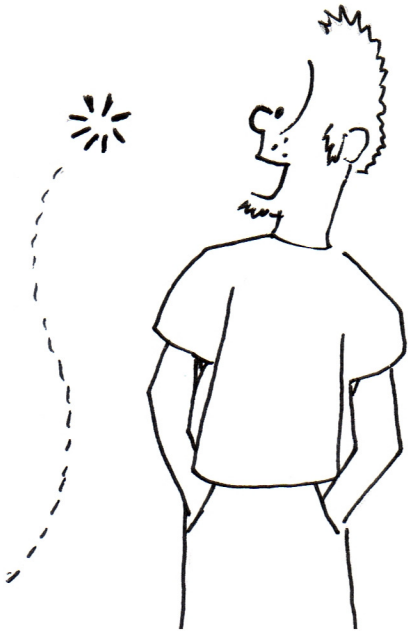
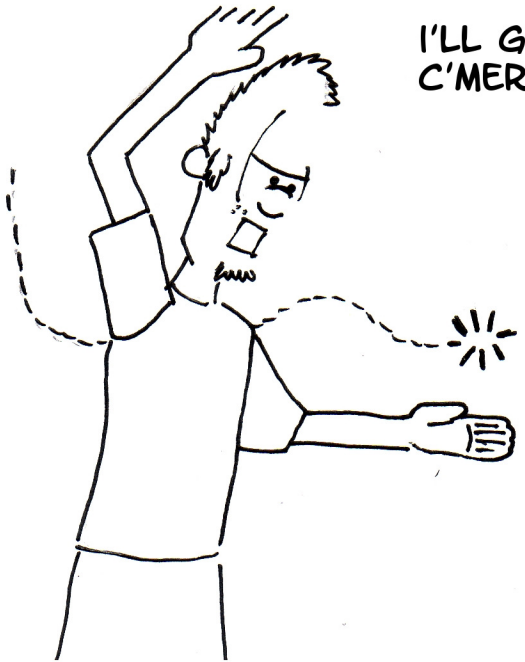
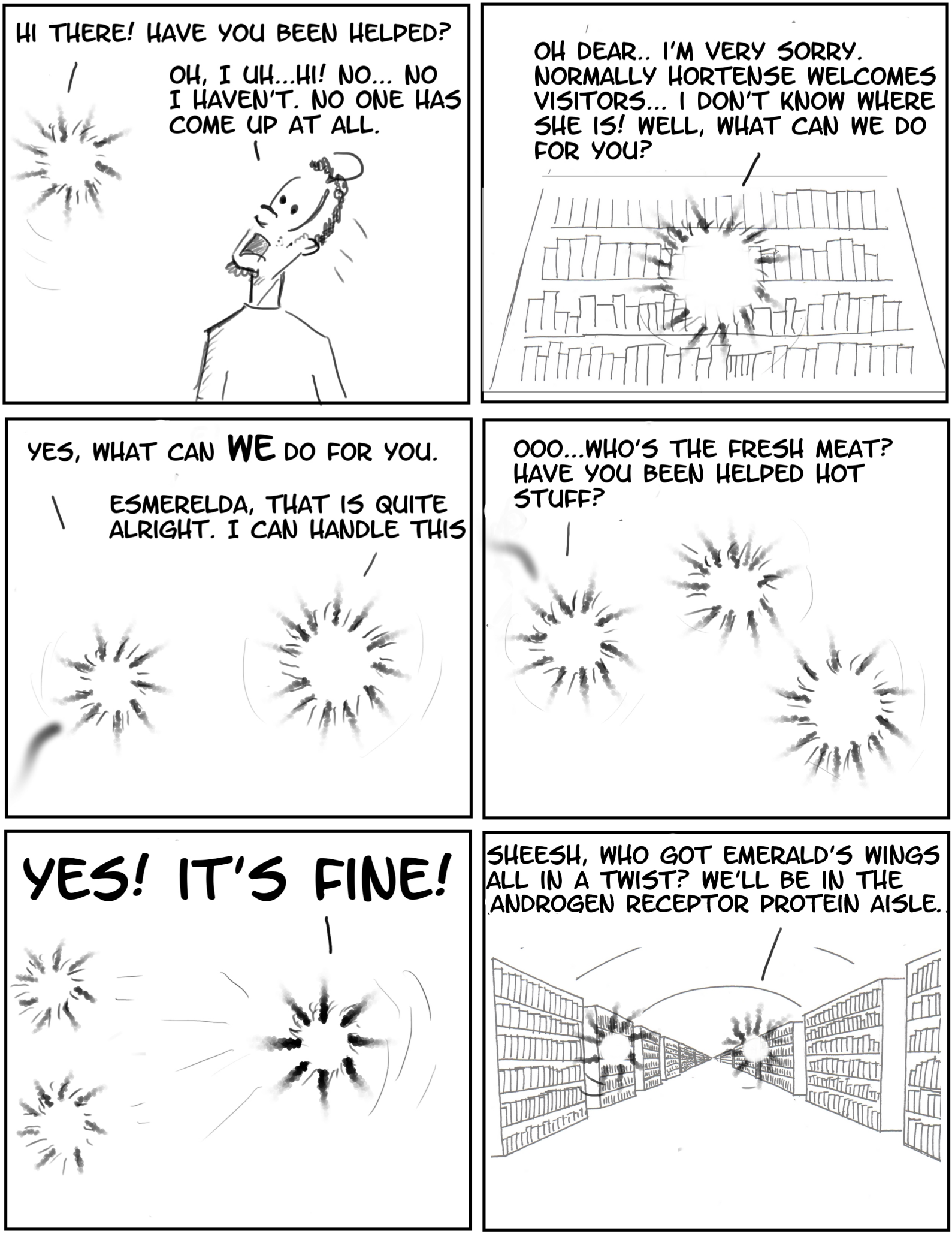


WELCOME ETHAN...TO YOUR ENTIRE GENOME. THIS IS ALL OF YOUR DNA, THE INSTRUCTIONS FOR BUILDING EVERY PROTEIN IN YOUR CELLS...PLUS A BUNCH OF TRASHY ROMANCE NOVELS IN THE BACK.





YA!
ETHAN NO!
SPLATIC
THAT WAS NO BUG. THAT WAS OUR HOST....A LIFAIRYIAN.
A WHA... A LIFAIRYIAN? OH. OH I SEE. OH DEAR.
THEY'RE UH... LOTS OF COLORS....ON MY HAND.. KINDA....YEAUGH. SQUISHY.
NOTHING TO SEE HERE...
TRASH


HI THERE! HAVE YOU BEEN HELPED?
OH, I UH...HI! NO... NO I HAVEN'T. NO ONE HAS COME UP AT ALL.
OH DEAR.. I'M VERY SORRY. NORMALLY HORTENSE WELCOMES VISITORS... I DON'T KNOW WHERE SHE IS! WELL, WHAT CAN WE DO FOR YOU?
YES, WHAT CAN WE DO FOR YOU.
ESMERELDA, THAT IS QUITE ALRIGHT. I CAN HANDLE THIS
OOO...WHO'S THE FRESH MEAT? HAVE YOU BEEN HELPED HOT STUFF?
YES! IT'S FINE!
SHEESH, WHO GOT EMERALD'S WINGS ALL IN A TWIST? WE'LL BE IN THE ANDROGEN RECEPTOR PROTEIN AISLE.

HEY THERE STUDENT/TEACHER!

ARE YOU ENJOYING THE BOOK? DON'T WORRY, THIS ISN'T THE POINT WHEN I TELL YOU THAT YOU HAVE TO PAY 4.99 FOR EACH ADDITIONAL CHAPTER.

I'M A BROKE TEACHER TOO, AND I KNOW THAT PAYING FOR CLASSROOM RESOURCES CAN BE TRICKY, SO THIS THING IS FREE!

HOWEVER, I WOULD REALLY APPRECIATE IT IF:

A) YOU SENT ME AN EMAIL AT JONATHANPHARRIS@GMAIL.COM AND TOLD ME HOW YOU ARE USING THE BOOK, AND ANY IMPROVEMENTS YOU CAN THINK OF

B) IF YOU DO FIND YOURSELF USING IT A LOT IN THE CLASSROOM, CONSIDER MAKING A DONATION AT

SITES.GOOGLE.COM/SITE/BIOLOGYGRAPHICNOVEL/HOME

THANKS SO MUCH!

BACK TO THE STORY....

I APOLOGIZE FOR THEM. THEY CAN BE A BIT...OVERBEARING AT TIMES.

HAHA.. HEY THAT'S OK. THEY WERE NICE

YES, WELL. WHAT GENE DO YOU NEED TODAY?

UH...A SNARE PROTEIN FOR LEAVING THE CITY?

OH, I....

A FAKE ID?!?! WHAT A REBEL!

WHATCHA DOIN WITH A FAKE ID EH STRANGER?

MAYBE HE'S A SPY! OOO! I'LL TELL YOU EVERYTHING! BUY ME DINNER FIRST THOUGH!

LEAVE!

SHEESH. NO FUN.

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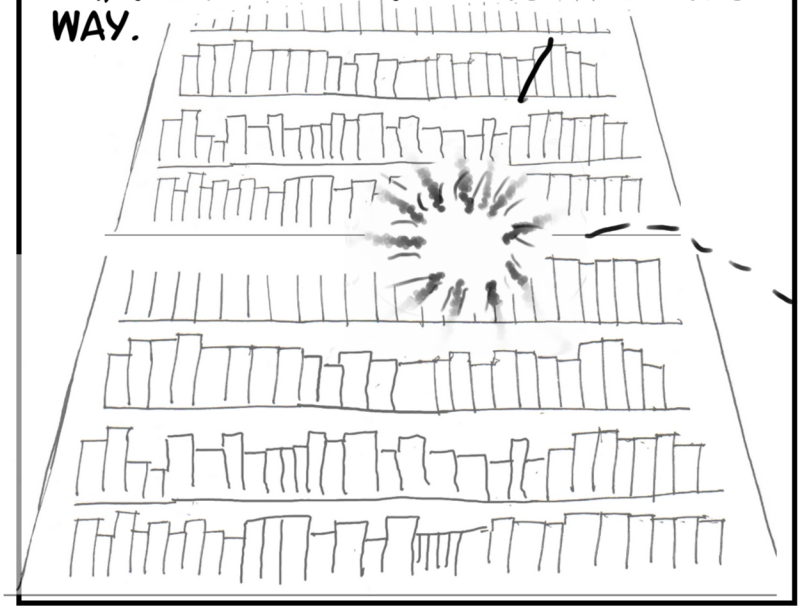
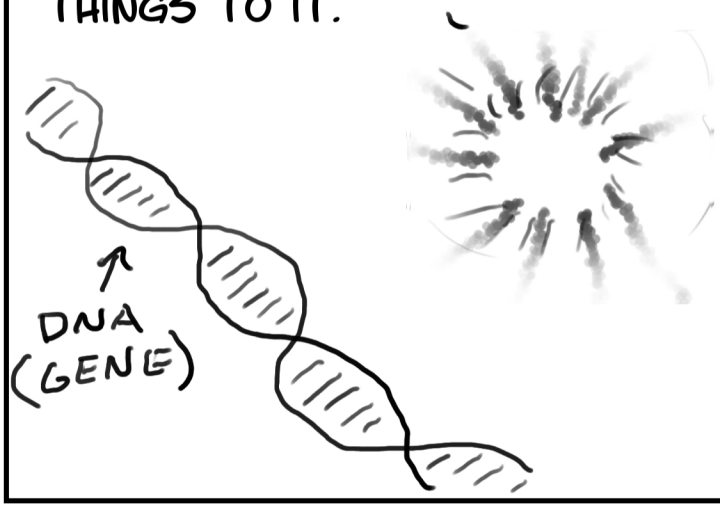
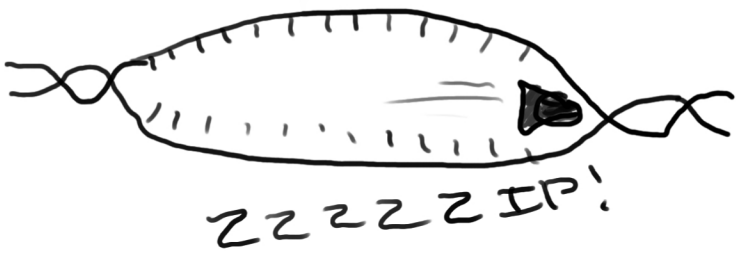
OK, NOW. PROTEIN TAGS ARE THIS WAY.



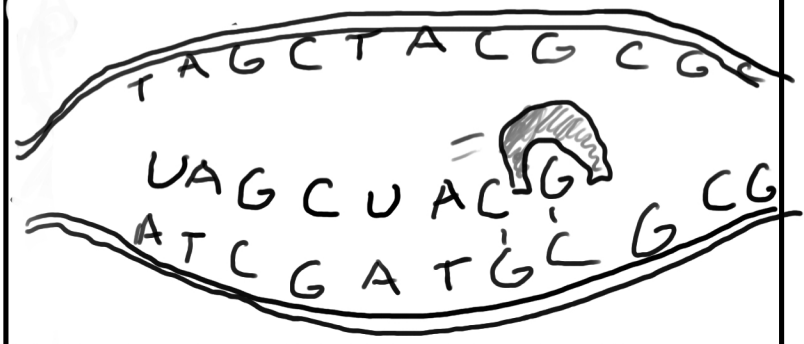
HERE WE ARE. NOW, BEFORE YOU CAN HAVE THIS DNA MADE INTO PROTEIN, WE HAVE TO DO A FEW THINGS TO IT.



FIRST, WE'LL UNZIP THE LADDER WITH A DNA HELICASE ENZYME.

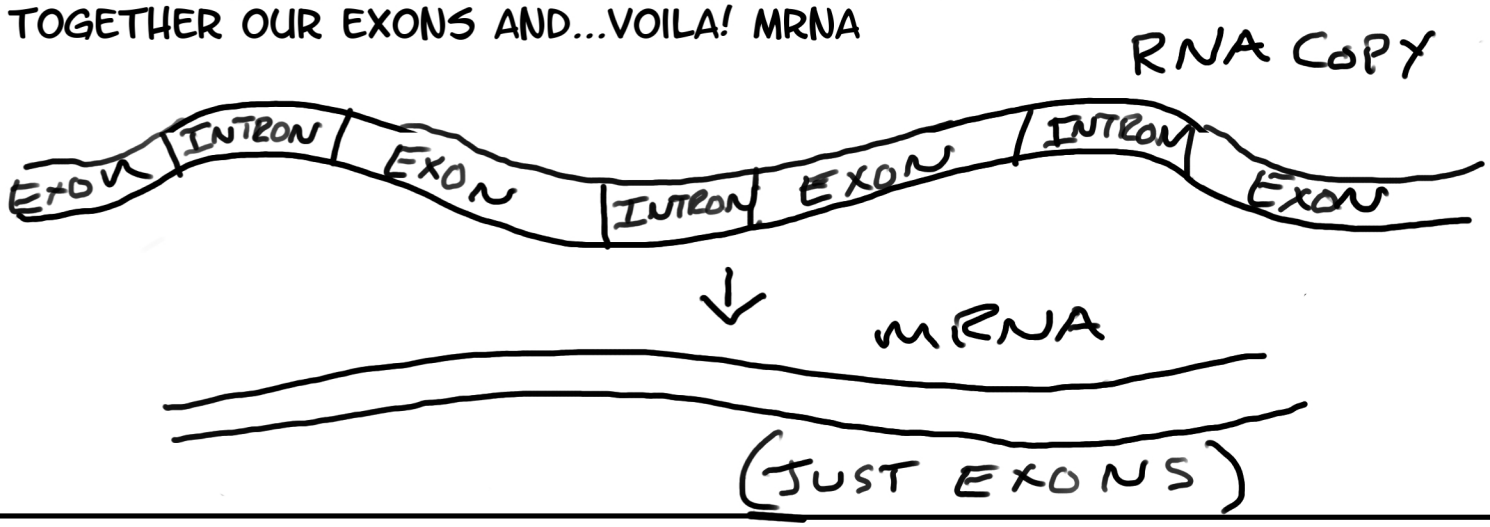


THEN, WE'LL USE AN RNA POLYMERASE ENZYME TO MAKE PHOTOCOPY OF THE GENE



NOTE: THE RNA POLYMERASE MAKES THE COMPLEMENTARY STRAND TO THE DNA IT IS READING. THERE IS NO T IN RNA, SO WE REPLACE ALL INSTANCES OF T WITH U (URACIL)

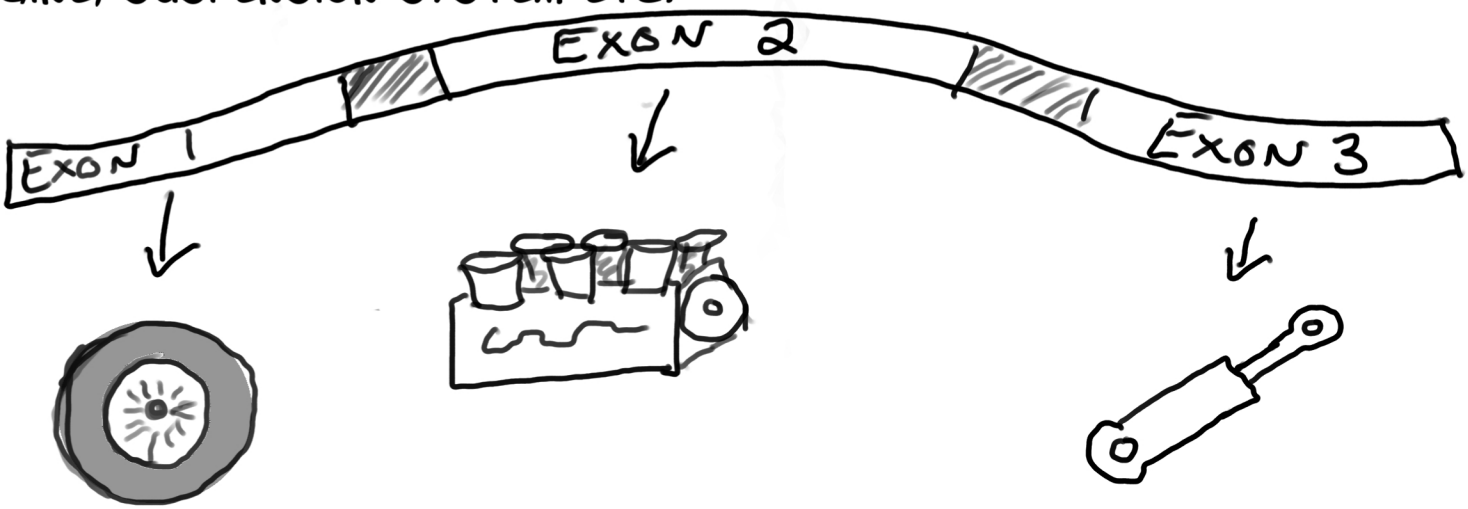
NOW, YOU SEE THERE ARE TWO TYPES OF RNA IN THIS PHOTOCOPY. EXONS ARE THE USEFUL BITS OF RNA THAT CODE FOR REGIONS OF PROTEIN. INTRONS ARE JUNK RNA. WE'LL CUT THESE OUT AND STICK TOGETHER OUR EXONS AND...VOILA! MRNA



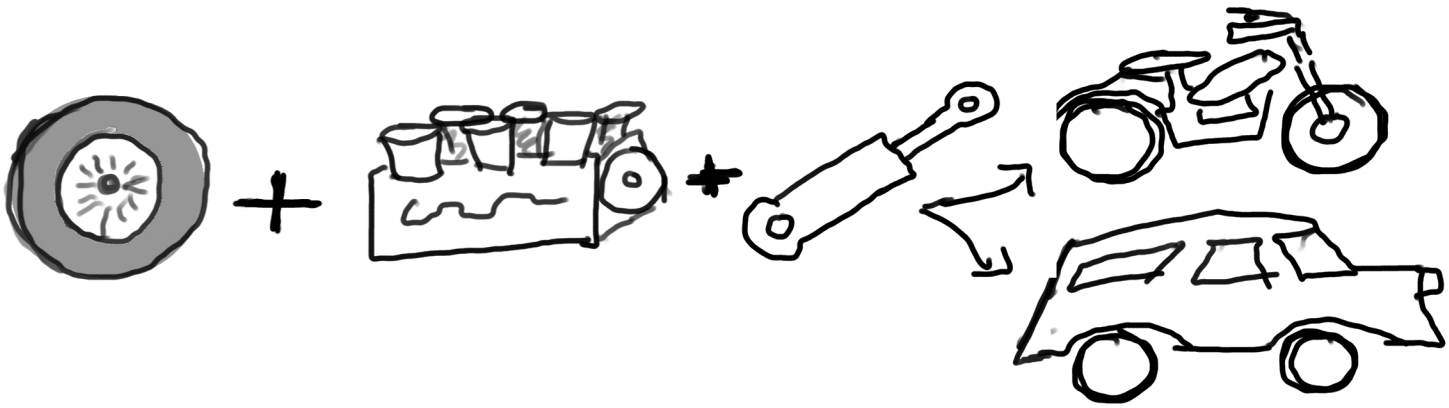
THE M STANDS FOR MESSENGER. THIS IS THE RNA THAT IS THE 'BLUEPRINT' FOR RIBOSOMES TO USE

OK... BUT WHY HAVE THE INTRONS THERE AT ALL? WHY NOT CUT 'EM ALL OUT?

OH! GOOD QUESTION! WELL, EACH EXON IS A USEFUL REGION OF DNA. LET'S SAY THESE EXONS REPRESENT DIFFERENT PARTS OF A CAR: WHEELS, AN ENGINE, SUSPENSION SYSTEM ETC.



BECAUSE OF THE INTRONS SEPERATING THESE DIFFERENT PARTS, WE CAN STITCH THEM TOGETHER IN DIFFERENT WAYS TO MAKE DIFFERENT PROTEIN FROM THE SAME GENES! THIS IS HOW YOU ARE SO COMPLEX, FROM SO RELATIVELY FEW GENES.



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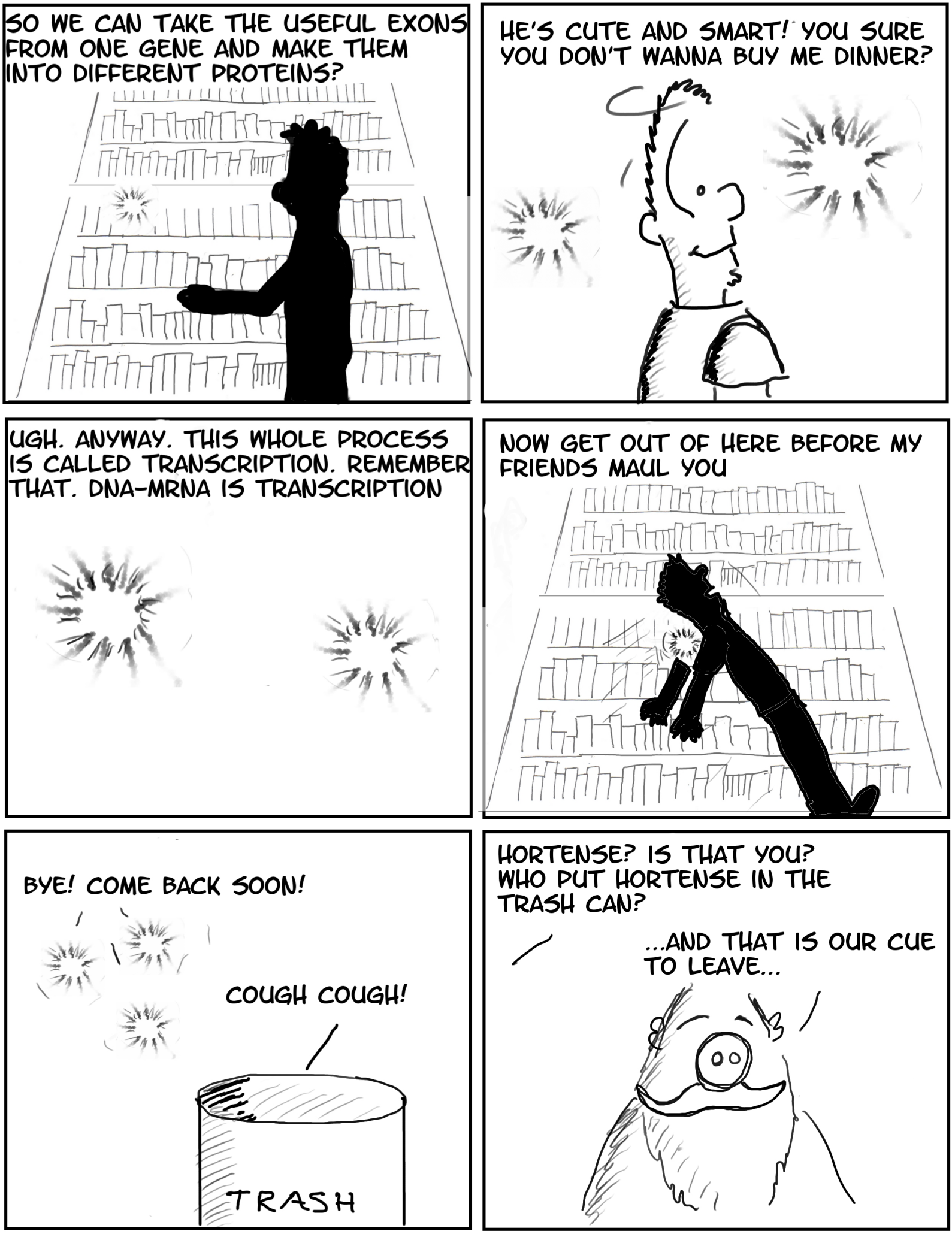
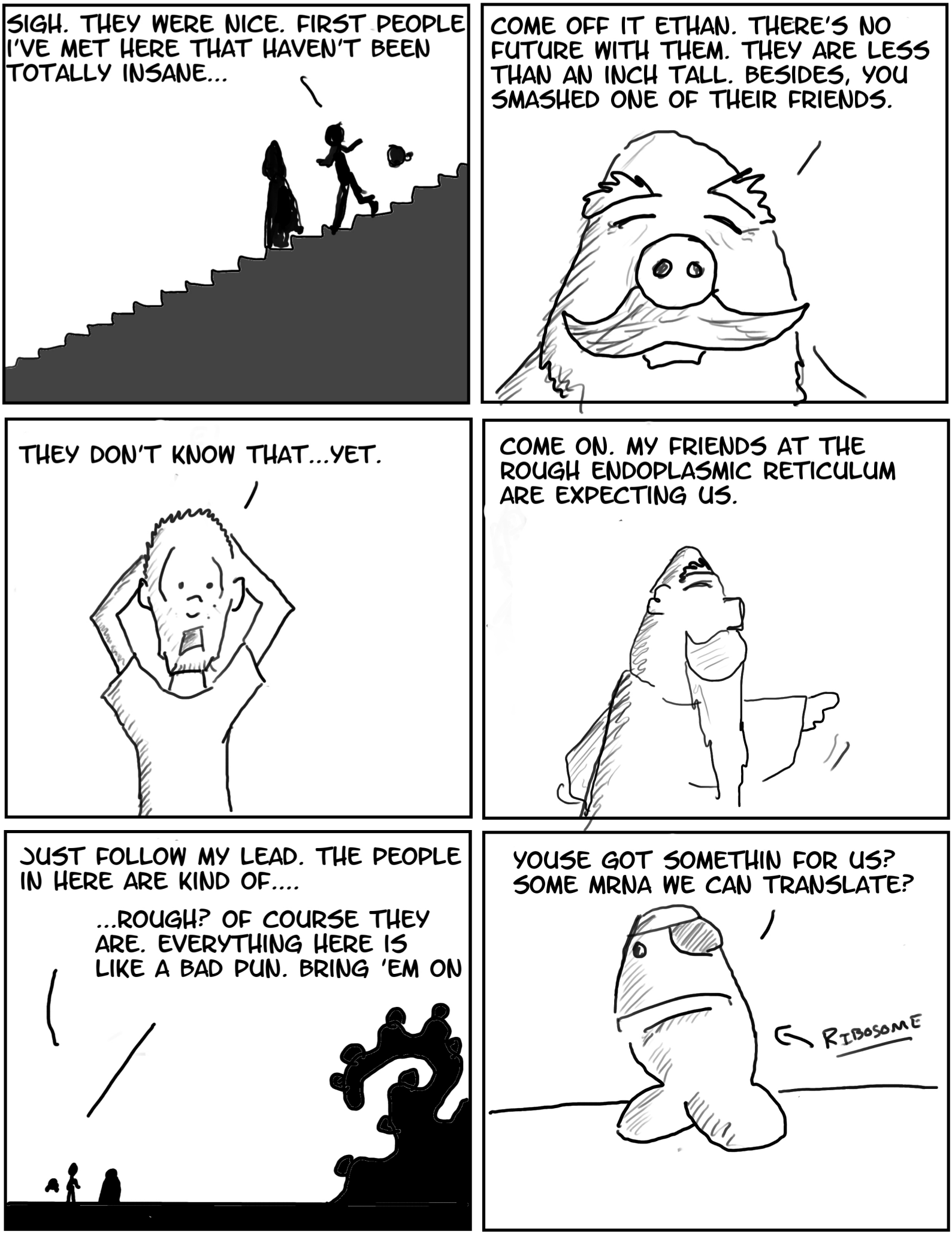

SO WE CAN TAKE THE USEFUL EXONS FROM ONE GENE AND MAKE THEM INTO DIFFERENT PROTEINS?
HE'S CUTE AND SMART! YOU SURE YOU DON'T WANNA BUY ME DINNER?
UGH. ANYWAY. THIS WHOLE PROCESS IS CALLED TRANSCRIPTION. REMEMBER THAT. DNA-MRNA IS TRANSCRIPTION
NOW GET OUT OF HERE BEFORE MY FRIENDS MAUL YOU
BYE! COME BACK SOON!
COUGH COUGH!
TRASH
HORTENSE? IS THAT YOU? WHO PUT HORTENSE IN THE TRASH CAN?
...AND THAT IS OUR CUE TO LEAVE...


SIGH. THEY WERE NICE. FIRST PEOPLE I'VE MET HERE THAT HAVEN'T BEEN TOTALLY INSANE...
COME OFF IT ETHAN. THERE'S NO FUTURE WITH THEM. THEY ARE LESS THAN AN INCH TALL. BESIDES, YOU SMASHED ONE OF THEIR FRIENDS.
THEY DON'T KNOW THAT...YET.
COME ON. MY FRIENDS AT THE ROUGH ENDOPLASMIC RETICULUM ARE EXPECTING US.
JUST FOLLOW MY LEAD. THE PEOPLE IN HERE ARE KIND OF....
...ROUGH? OF COURSE THEY ARE. EVERYTHING HERE IS LIKE A BAD PUN. BRING 'EM ON
YOUSE GOT SOMETHIN FOR US? SOME MRNA WE CAN TRANSLATE?
RIBOSOME

HMMM. A PROTEIN ID TAG EH? SURE. WE CAN MAKE THIS FOR YOU

LESSEE... STARTS WITH A AUG... YO! TRNA! BRING ME METHIONINE!

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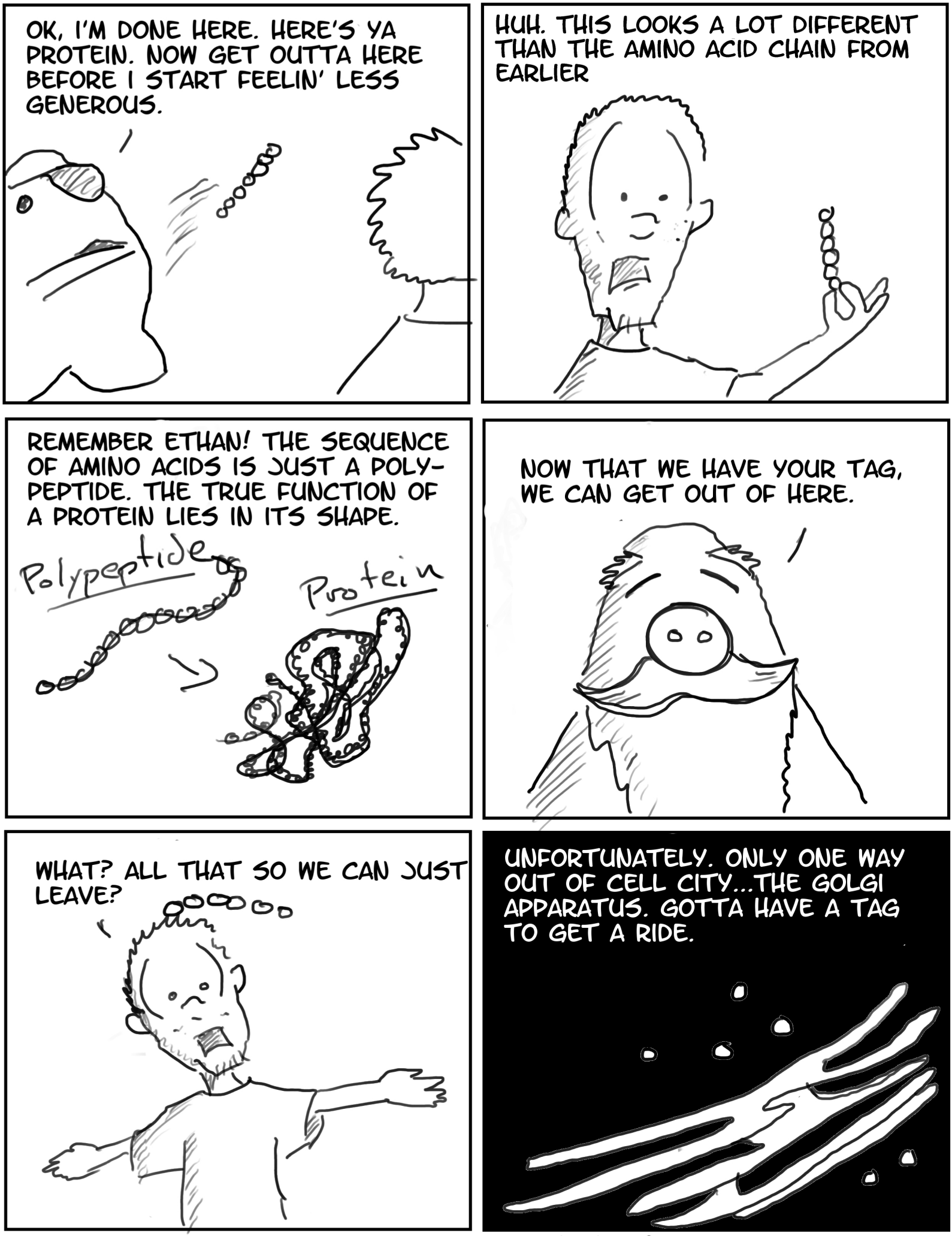
DOES HE HAVE TO YELL IN OUR EARS?

HE'S A RIBOSOME. RIBOSOMES BUILD PROTEINS OUT OF AMINO ACIDS...

I NEED LYSINE! TRNA!

AS HE READS DOWN THE MRNA, EACH THREE LETTER SEQUENCE (A CODON) MEANS ONE AMINO ACID.

THESE TRNAS THEN TRY TO BIND WITH THE MRNA, IF THEY FIT, THEN THEY GIVE THEIR AMINO ACID THEY ARE CARRYING TO THE RIBOSOME, AND HE JOINS THEM ALL TOGETHER INTO OUR PROTEIN.



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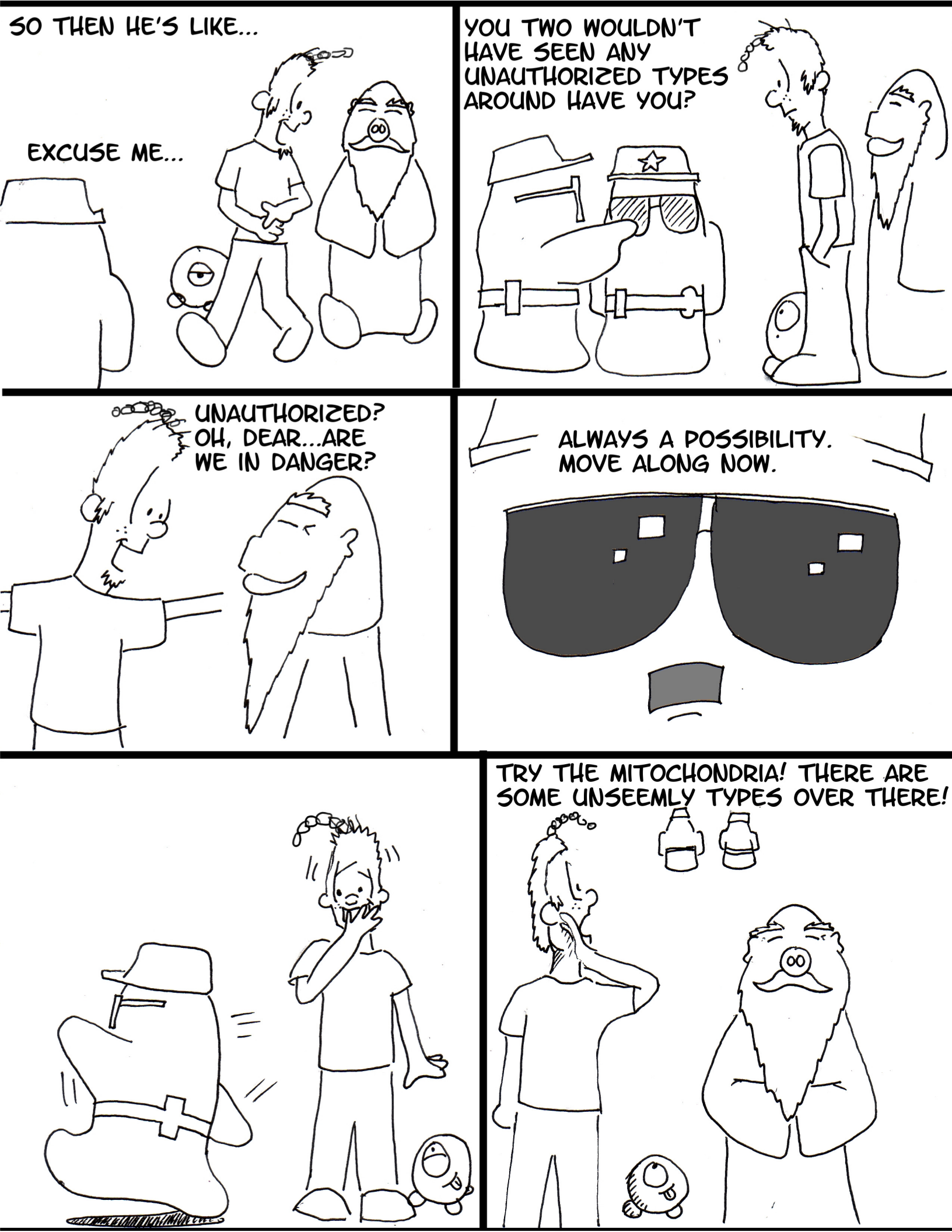
SO THEN HE'S LIKE...
EXCUSE ME...
YOU TWO WOULDN'T HAVE SEEN ANY UNAUTHORIZED TYPES AROUND HAVE YOU?
UNAUTHORIZED? OH, DEAR...ARE WE IN DANGER?
ALWAYS A POSSIBILITY. MOVE ALONG NOW.
TRY THE MITOCHONDRIA! THERE ARE SOME UNSEEMLY TYPES OVER THERE!

CHAPTER 7 REVIEW

1. WHY IS IT POTENTIALLY USEFUL THAT YOUR GENES ARE CHOPPED UP WITH INTERRUPTING INTRONS IN BETWEEN THE EXONS?

2. WHAT IS MRNA, AND HOW IS IT FORMED?

3. EXPLAIN HOW A RIBOSOME MAKES A PROTEIN FROM A GENE. WHAT IS A CODON? WHAT ABOUT A TRNA? AN AMINO ACID?